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Book reviews

Organic Photoreceptors for Imaging Systems
P.M. Borsenberger and D.S. Weiss, Marcel Dekker, New York, 1993, 464 pages, $135
ISBN 0-8247-8926-1

It is of interest to observe the ways in which applied scientists in the field of electronics and optoelectronics have come to appreciate the richness, diversity and usefulness of chemistry and also to note that chemists are increasingly aware of the enormous area of potential development. Many of the bottlenecks in the development of electronic materials for devices are materials-related and as the chemist is aware, the properties of bulk materials stem from those of the isolated molecule. First though, the chemist must be aware of the technological challenge, and in this text Borsenberger and Weiss lay out the basis of electrophotography or xerography.

The process is briefly as follows. An electrostatic latent image is created on the surface of a photoconducting material by first charging its surface followed by exposure to UV radiation. The image is developed using toner particles which are transferred electrostatically to a paper receiver and then fused permanently into place. The key step is of course the formation of the latent image on the photoreceptor and although early materials were elemental in composition (sulphur, selenium), followed in the 60s by chalcogenide glasses, the demands of durability, flexibility, stability etc. have led to increased usage of organic materials.

The absorption of image exposure by the photoreceptor causes electron–hole pairs which separate under the electrostatic field to the free surface and the substrate electrode. This process builds up an electrostatic charge pattern of the image to be copied. There are certain important electronic criteria, all discussed in detail in the book. Theories of photogeneration are described prior to an introduction to organic materials of relevance; phthalocyanines, polyarenes and a range of other materials both polymeric and polydisperse. Similarly, theories of charge transport are introduced prior to an extended discussion of electron, hole and bipolar transport in a wide range of polymeric and non-polymeric species. The range of topics covered is impressive, and in addition to coverage of theoretical models there is detail on the technology of photoreceptor production and fatigue effects as well as a lengthy description of the properties, the synthesis, and the characterisation of the various classes of photoreceptor.

The book provides a very useful way of coming rapidly up to speed in this technologically important and still growing area. It is written in the form of a review, with relatively little text devoted to extensive looks forward or back. The style is businesslike and to the point. It constitutes a comprehensive and coherent treatment of the theory and practicalities of xerography, and represents excellent value for researchers entering or working in this field.

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New Aspects of Organic Chemistry II: Organic Synthesis for Materials and Life Sciences
Z. Yoshida and Y. Ohshiro (eds.), VCH, Weinheim, 1992, 521 pages, DM 225, £85.00
ISBN 3-527-290134-1

New Aspects of Organic Chemistry II is a collection of lectures presented in November 1991 at the Fifth International Kyoto Conference on New Aspects of Organic Chemistry. The book is divided into three sections: (I) Efficiency in Organic Synthesis (242 pp.); (II) Organic Synthesis for Materials Sciences (186 pp.); (III) Organic Synthesis for Life Sciences (190 pp.).

The first and largest section on Efficiency in Organic Synthesis contains seven contributions on organometallic topics by G. Wilke, H. Alper, I.P. Beletskaya, K. Smith, K. Koga, H. Sakurai and G. Boche together with articles by H.P. Husson, A. Dondoni, A. de Meijere and S.E. Denmark.

The second section on Organic Synthesis for Materials Science contains an article by M. Ishikawa on the Synthesis and Conducting Properties of Poly[(disilany-

lene)ethylnylenenes] and six other contributions by J.L. Dye, A.G. MacDiarmid, J.O. Morley, L.Y. Chiang, A. Kakuta and D.S. Donald on organic materials with interesting chemical, optical, electronic and magnetic properties.

The third section on Organic Synthesis for Life Sciences contains an article on metal-based Selective Oxidations in Organic Chemistry using Biomimetic Catalysts by D. Mansuy and four contributions from T. Shiba, H. Yamada, P.G. Schultz and Y. Kanaoka on peptides, enzymes, antibodies and ion channels.

All of the chapters are well written and generally easy to read. The editors and authors are to be congratulated; the book overall is extremely well produced despite being a collection of camera-ready manuscripts, and represents a compilation of reviews of the various distinguished authors' contributions. The volume admirably demonstrates the extent to which very many areas of science rely on the crucial contributions of organic, and in particular, organometallic chemistry. Chemists from all disciplines would gain from reading this book, but its very broad scope and high price (£85) make this a library book rather than one for individual collections.

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Coordination Chemistry of Aluminium
G.H. Robinson (ed.) (Howard L. Hunter, Chemistry Laboratory, Clemson University, Clemson, SC 29634-1905, USA) VCH, New York, xiii + 232 pages
DM189
ISBN 1-56081-059-9

Aluminium is the third most abundant element in the Earth's crust. Its coordination chemistry, which determines its speciation in natural waters, its mineralogical transport and distribution, its effect on biology and its role in the environment, are of immense importance. Curiously, however, the coordination chemistry of aluminium in aqueous solution has hitherto been little studied and therefore not very well understood. That is why in this book there is only one chapter, out of five covering particular ligands, on aqueous solutions. The others cover areas where chemistry has to be studied in environments where water is rigorously excluded and aluminium–carbon–nitrogen or–phosphorus bonds are instantly converted by moisture into the aluminium–oxygen bonds that are ubiquitous in the natural environment.

The book comprises six chapters, all by internationally acknowledged experts. The first by A. Haaland (University of Oslo) is a survey of normal and dative bonding in neutral aluminium compounds. This brings together and rationalises an enormous body of structural and thermodynamic data and shows how subtle changes in bond lengths in complex coordination compounds can be understood. The second chapter, by G.H. Robinson, is a straightforward factual summary of coordination compounds based on aluminium–nitrogen bonds. Since valence requirements mean that aluminium nitride itself forms a three-dimensional lattice many molecular coordination compounds are organometallic, with small aluminium–nitrogen cores separated by peripheral organic groups. There is a good summary here both of early work on derivatives of simple amines and of more recent studies on products form multidentate amines where Professor Robinson's own contributions have been extensive. The third chapter on aqueous coordination chemistry is by C. Orvig (University of British Columbia). There are several pages showing organic ligands, associated thermodynamic data (the compilation is illustrative rather than comprehensive), and ^{27}Al NMR results. Low valent and paramagnetic compounds of aluminium are considered by A.R. Barron (Harvard): some of these are transient species investigated mainly by ESR but a number of well-characterised compounds with aluminium–aluminium bonds have recently been made by W. Uhl. The chemistry of alkoxides, thiolates and the heavier Group 16 derivatives of aluminium and gallium are described by J.P. Oliver, R. Kumar and M. Taghiof (Wayne State University). A glance at the reference pages show the enormous advances made in the last few years. The final chapter by J.L. Altwood (University of Alabama) on anionic and cationic organoaluminium compounds describes liquid clathrate compounds and compounds with cyclic ethers.

Though this book makes no claim to be about organoaluminium chemistry, the reviews in it are of considerable interest to those working in this area. They are up-to-date and authoritative and are likely to stimulate even more work in a rapidly developing field.

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Gmelin Handbook of Inorganic and Organometallic Chemistry, 8th Edition, Gallium Supplement Volume D1
J-C. Maire, K. Greiner, M. Kotowski, V. Kruppa, M. Mirbach, E. Schleitzer-Rust and D. Tille, Springer, Berlin, 1992, xvi + 320 pages
ISBN 3-540-93657-2

The main volume of Gmelin covering the chemistry of gallium was published as long ago as 1936. Since